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Ciro Avitabile

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University of Naples Federico II

University of Salerno

Bocconi University, Milan

CSEF - Centre for Studies in Economics and Finance
DEPARTMENT OF ECONOMICS – UNIVERSITY OF NAPLES
80126 NAPLES - ITALY
Tel. and fax +39 081 675372 – e-mail: csef@unisa.it

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Advantageous Selection in the Private Hospital Insurance Market in Europe: Evidence on the Role of Education and Cognitive Ability

Ciro Avitabile*

Abstract
We use microdata from the Survey of Health, Ageing and Retirement in Europe to study the presence of asymmetric information in the market for private hospital insurance among individuals aged 50+ in eight European countries. We find evidence of advantageous selection and document the role of education and cognitive skills as important sources. Both education and cognitive skills are positively correlated with hospital insurance cover and negatively correlated with the ex post probability of requiring hospital treatment. Finally, we exploit within country variations in quality of regional health promotion, to provide suggestive evidence that the ability to acquire health information is one of the relevant pathways through which education and cognitive ability affect demand for private insurance.

Keywords: Asymmetric Information, Hospital Insurance, Advantageous Selection, Health Information

JEL Classification: D82, G22, I11

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* University of Naples "Federico II" and CSEF.

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1 Introduction

In most European countries, government is the main provider and source of funding for healthcare. However, a variety of macroeconomic factors (especially an ageing population) are causing dramatic reductions in public healthcare benefits, starting from the early 1990s.[1] European country governments have tried to boost take up of voluntary private health insurance (VPHI) to complement or supplement public healthcare, through the introduction of tax incentives. However, the evidence suggests that the effects have been negligible.[2] Private insurance cover for Europe is low on average, and varies dramatically across countries. We use individual data from the first two waves of the Survey of Health, Ageing and Retirement in Europe (SHARE) to provide evidence on the presence and the sources of asymmetric information in the market for private hospital insurance among individuals aged 50-75 in eight European countries.[3]

The classic adverse selection models (Rothschild and Stiglitz (1976) and Wilson (1977)), assume that potential insurance buyers have one-dimensional private information on their risk type. These models predict a positive correlation between insurance cover and ex post realization of loss: *high risk* individuals are more likely to have incentives to buy insurance. Ex post moral hazard strengthens the positive correlation between cover and loss realization. The "positive correlation property" of classic asymmetric information models has been tested in several studies whose results are mixed and differ by markets.[4] Based on these results, both theoretical and empirical studies explore the possibility that multidimensional private information

[1] According to OECD Health Data (2009), in 1995 public health expenditure in Germany represented 81.6% of total health expenditure, in 2007 this dropped to 76.9%. Over the same time period in Sweden, the percentage of public health expenditure dropped from 86.6% to 81.7%. Other countries, such as France and Spain, have witnessed smaller reductions.

[2] See Emmerson et al. (2001) for the UK and Rodriguez and Stoyanova (2008) for Spain.

[3] The SHARE data collection has been primarily funded by the European Commission through the 5th framework program (project QLK6-CT-2001-00360 in the thematic program Quality of Life). Additional funding came from the US National Institute on Ageing (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, Y1-AG-4553-01 and OGHA 04-064). Data collection in Austria (through the Austrian Science Foundation, FWF), Belgium (through the Belgian Science Policy Administration) and Switzerland (through BBW/OFES/UFES) was nationally funded. The SHARE data set is presented in Börsch-Supan et al. (2005).

[4] Chiappori and Salanie (2001) conduct a positive correlation test for the car insurance market in France. Chiappori (2000) provides an extensive survey of the theoretical and empirical literature. See Cutler and Zeckhauser (2000) for a review of applications in the health insurance market.

can lead to what has been defined as *advantageous selection*. Theoretically, de Meza and Webb (2001) postulate that individuals have private information about both risk type and attitude towards risk. They argue that selection based on risk attitude is advantageous in the sense that more risk averse individuals are both more likely to buy insurance and less likely to incur future losses. Therefore, the failure to condition on risk aversion can mask the positive correlation between insurance cover and ex post loss, predicted by one-dimensional models of asymmetric information. Finkelstein and McGarry (2006), in a study of the long term care (LTC) insurance market in the US, provide empirical evidence that individuals who are more risk averse are more likely to own LTC insurance and less likely ultimately to have to enter a nursing home.[5] However, risk preference is only one of the potential sources of private information that can lead to advantageous selection; all individual characteristics not observed by the insurance companies that are positively correlated with the propensity to buy insurance, and negatively correlated with future accident probability, can act as sources of advantageous selection. Fang et al. (2008) find evidence of strong advantageous selection in the Medigap insurance market and, among other things, they point education and cognitive skills as being prominent sources.

The objective of this work is to assess whether asymmetric information can undermine the efficient operation of the private hospital insurance market in eight European countries and to examine the role of education and cognitive skills as potential sources of asymmetric information. Existing evidence suggests that better educated individuals are less likely to incur health shocks,[6] thus reducing the potential need for hospital treatment. At the same time, there is evidence from several European countries of a strong positive correlation between education and the probability of purchasing private health insurance.[7] Since insurance companies in Europe are not allowed to use information on either education or cognitive ability, these variables might act as sources of private information and contribute to offsetting the positive

[5] Cutler et al. (2008) provide evidence on the role of risk aversion in other insurance markets.

[6] Among others, Mullahy (1999) and Kenkel (1994) provide evidence that better educated individuals are more likely to engage in health prevention activities. Kenkel and Terza (2001) show that better educated individuals are less likely to engage in risky behaviors.

[7] See Propper et al. (2001) for the UK; Finn and Harmon (2006) for Ireland; Mossialos and Thomson (2004) and references therein for other European countries. Paccagnella et al. (2008), using data from the first wave of SHARE, find that, while the main determinants of voluntary private health insurance vary across countries, education and cognitive abilities have a strong positive effect on holding a VPHI policy among the elderly in European countries.

correlation between insurance cover and ex post realization of loss, thus producing advantageous selection.

In most European countries basic hospital services are provided free of charge under the statutory health insurance, and hospital care is the major component of healthcare expenditure (around 40%). Private hospital insurance - defined as cover that gives individuals an extended choice of hospitals (and clinics) for hospital care, and/or full cover for the costs of hospital care - is by far the most common type of private health insurance among the individuals in our sample: coverage rate is 17% as opposed to 5% coverage for insurances that allows extended choice of doctors and specialists, and less than 1% coverage for long term care in either a nursing home or the individual's own home.

Health insurance markets are strictly regulated in all the EU countries in our analysis and, since the introduction of the third non-life insurance Directive in 1992, the rules have become increasingly harmonized. Standardization of hospital insurance contracts makes this market suitable for investigating the presence of multidimensional private information. The theoretical findings in Chiappori et al. (2006) suggest that, in order for multidimensional private information to manifest itself as a violation of the positive correlation property, insurance companies should not be free to offer whatever insurance contracts they choose. There are at least two advantages in using SHARE data to study the presence of multidimensional private information in the hospital insurance market in Europe. First, we can exploit the panel dimension of the dataset to construct an individual measure of ex post realization of loss, as defined by the probability of spending at least one night in hospital in the 12 months before the second wave interview. Second, SHARE collects extremely rich and detailed information on individuals in relation to past and current health as well as standard demographics. This allows us to replicate the information set used by the insurers to price insurance policies.

The strategy adopted in this paper to study the presence of asymmetric information in the private hospital insurance market in Europe is closely related to that one adopted by Finkelstein and McGarry (2006) in their analysis of the LTC market in the US. Initially, we test whether, conditional on insurers' assessments of a person's risk type, there is a statistically significant correlation between private hospital insurance cover, as recorded in the 2004 wave, and the probability of spending at least one

night in hospital in the 12 months before the 2006 interview. We did not detect any statistically significant correlation. This result is consistent with "non-asymmetric information" and with "multidimensional private information". In contrast to the first explanation, we find that a subjective assessment of survival probability contained in the 2004 questionnaire is positively correlated to the probability of hospital insurance cover and negatively correlated with ex post loss. However, even after controlling for subjective survival probability, there is no evidence of a positive correlation between insurance cover and an ex post risk of hospitalization. Since the subjective assessment of survival probability is not observed by the insurers, this result supports the hypothesis that there are multidimensional sources of private information that lead to advantageous selection. We then study the role of education and cognitive skills and find significant evidence that they are important sources of advantageous selection.

In order to shed light on the mechanisms that explain this advantageous selection, we test whether more educated and cognitively able individuals buy more insurance because they are more likely to be informed about health related issues. First, we use data from Eurobarometer "EU citizens and sources of information about health" (2002) to provide evidence that better educated individuals are more likely to substitute health professionals with informal sources (the Internet, newspapers, television) when looking for health related information. We then exploit within country variations in the quality of health promotion to document that both years of education and cognitive skills act as substitutes for (proxies of) quality of health promotion at regional level. On average, a one standard deviation increase in the scores for the recall ability tests is associated with an increase of 1.6 percentage points in the probability of signing a private hospital insurance. However, the effect is 1.2 percentage points higher in regions with low quality compared to those with high quality health promotion.

To our knowledge, this is the first study that tests for asymmetric information at cross country level, and provides two main contributions. First, it contributes to the literature on the different dimensions of individuals' unobservable characteristics which affect the decision to purchase a health insurance. Second, we show that asymmetric information can contribute to explain the low levels of health insurance coverage in many European countries. This analysis has important policy implications for the organization of healthcare systems in Europe. While tax incentives have

proved to be not very effective in boosting private insurance take up, government might invest more resources in health information programmes. Our results can be read as evidence that these programmes can contribute to reducing health inequalities. Therefore, when evaluating the benefits/costs of information and prevention campaigns, governments should take explicit account of their indirect effects on private insurance take up.

The paper is organized as follows. In Section 2 we provide some background on the data and on the institutional context of private health insurance in selected EU countries. Section 3 provides descriptive evidence and outlines the empirical strategy. Section 4 presents the findings and Section 5 concludes.

2 Background

2.1 Data

As main data source, we draw on information from the two waves of SHARE, which surveyed the 50+ population, in 2004 and 2006. This survey is multidisciplinary and uses a cross-sectional panel database with a wide range of topics, including physical health, socioeconomic status, income and intensity of social interaction. Some questions refer to households (e.g. income), others are addressed to all eligible members within a household and their partners: for instance, indicators of health status and behaviour. SHARE also includes a section with questions on preferences, beliefs, attitudes and other items. There are detailed questions about the purchase and type of health insurance, and health related out-of-pocket expenditures. The first wave of the survey covered more than 30,000 individuals in 11 countries. Data from the second wave are still preliminary for some countries. Of the original 11 countries covered by SHARE, we exploit data on 8 for the econometric analysis. We exclude Switzerland and France since it is not possible to follow most individuals over time, due to the provisional version of the second wave data.[8] We also exclude the Netherlands because of the institutional features of that country's healthcare system and the recent reform in the statutory healthcare system. Until January 2006, Dutch healthcare

[8]Moreover, the regulatory framework of the health insurance market in Switzerland differs substantially from those in the remaining countries.

combined Social Health Insurance (SHI), which guaranteed basic insurance cover for low-income earners, with a Private Health Insurance (PHI) scheme for high earners who could opt out of SHI. As result, only 72% of the Dutch population was covered by the statutory health insurance (the average for the other countries is above 90%). The 2006 Healthcare Act scrapped the division between SHI and PHI and introduced a single insurance regime.

With the exception only of Germany and Austria, contracts for elderly people are usually on an annual basis and individuals aged over 75 are not able to buy private hospital insurance. Our final sample includes 5,676 males and 6,597 females in Austria, Belgium, Denmark, Germany, Greece, Italy, Spain and Sweden, aged between 50 and 75.

We also rely on an auxiliary data source, the Eurobarometer "EU citizens and sources of information about health" (2002). Since 1973, the European Commission has been monitoring the evolution of public opinion in the Member States by running the Eurobarometer Surveys. In 2002, 17,041 individuals in fifteen European countries have been addressed a variety of questions about their main health information source, the number of different sources they rely on and how much they trust them. A limited number of demographic characteristics are reported as well: gender, age, marital status, professional status, age of completion of schooling. We restrict the sample to all individuals older than 20 and younger than 80 in the 8 European countries covered by our main analysis.

2.2 Institutional Setting

This section provides some basic detail on the regulatory framework of private health insurance in selected countries. There are different types of VPHI, but they can be classified into three major types according to how they integrate the public system: *duplicate*, *complement* and *supplement*. We do not study the determinants of *duplicate* coverage in this work. *Complementary* private insurance provides full or partial coverage for services that are excluded or not fully covered by the statutory health-care system. It is available for the whole population, albeit in different forms, in all the countries in our analysis. *Supplementary* health insurance serves to increase consumer choice and access to different health services, guaranteeing faster access

to treatment and increasing the quality of accommodation and amenities. In most cases, *supplementary* private insurances increases the choice of provider and benefits. Individuals with *supplementary* insurance may be treated in private hospitals, buy private treatment in public hospitals, or receive benefits in cash rather than in kind. *Supplementary* insurance sometimes is described as "double coverage".

In most European countries there is universal basic coverage, but there are a few exceptions. In Germany about 9% of the population is covered by primary private insurance (the self-employed who are excluded from the social security system, employees above an income threshold who opt for private insurance, and public employees, for the portion of health care expenditure not directly reimbursed by the government). Similarly, in Belgium, Spain and Austria there are small percentages of the population (mainly comprising self-employed and civil servants) who are not covered by primary health insurance.

We now describe the methods used to set private insurance premiums and the variables used in risk ratings as these are essential for the "positive correlation" test presented in the next section. Risk rating is the method most commonly used by insurers in the EU to set prices for complementary and supplementary VPHI. It is used to varying degrees and for different types of VPHI in all the countries covered by our analysis. Table 1 provides examples of the variables used to set premiums. These include age, sex, occupation, household size, medical history, family history. Group rating is used in Denmark, Greece, Italy and Sweden mainly for group policies. In Belgium mutual associations can sell policies with flat rate premiums, but these are not widespread. Insurers that use health status as a variable in risk rating premiums require applicants to complete a medical questionnaire. This questionnaire can include questions about a family's history of disease.[9] The use of medical examinations to set premiums is not very common in the countries analysed.[10]

Tax incentives are in place in most countries in our sample with some important differences. In Denmark and Spain there are no deductions for employees, but firms can deduct employer based premiums from tax. In Germany, Greece, Italy and Sweden there are tax provisions for individuals, and only in some cases for employers.

[9] According to Mossialos and Thomson (2004) family history of disease is required only in Greece.

[10] While Austria explicitly forbids insurers to conduct medical examinations, in Belgium they are common practice for commercial policies.

There is no systematic evidence on the market structure of private health insurance across EU countries. In 2005, Italy and Spain had the highest number of health insurance companies (respectively 93 and 87) and Austria and Sweden had the lowest (respectively 7 and 6). Mossialos and Thomson (2004) collecting data from different sources find evidence that market concentration, measured by the market shares of the three largest insurers, is particularly high in Austria (84%), Sweden (80%) and Greece (70.4%). Concentration rates are much smaller in Belgium (49%) and Italy (33%). Data on the administrative costs of voluntary health insurers are limited. The evidence in Mossialos and Thomson (2004) suggests that these costs are high compared to those in the statutory healthcare system, especially in Austria, Belgium and Italy.

3 Empirical Analysis

3.1 Descriptives

Figure 1 shows the proportion of individuals aged 50-75 covered by private hospital insurance. Belgium and Austria are the countries with the highest take up, while Italy, Sweden and Greece have the lowest. The high coverage in Belgium is partly due to the special regime for the self-employed, which account for about 6% of the total population in this older age group. The statutory health insurance scheme does not cover self-employed people for 'minor risks', which include minor operations.[11]

In order to define the individual accident probability, we use the following question: "During the last 12 months have you been in a hospital over night?". Figure 2 plots the average probability of being in hospital overnight in the 12 months before the 2006 interviews of subjects interviewed in the 2004 wave. Countries where the percentage of the population covered by private insurance is higher on average display a higher average probability of entering hospital. However, while in Austria the probability is much higher for those covered by private hospital insurance, in Belgium and Germany the probability is slightly higher for those not covered by insurance. Among individuals living in low insurance coverage countries the risk of entering hospital is

[11] However, the hospital insurance coverage does not vary significantly between self-employed and employed people in Belgium.

much higher for those not covered by hospital insurance. The difference between insured and not insured is particularly striking in Italy and Sweden, providing evidence of some advantageous selection.

In order to measure whether individuals have residual private information with respect to the risk assessment exercises performed by insurance companies, we use the self-assessed survival probability. In SHARE 2004 the question is worded as follows: "What are the chances that you will live to be age T or more?". The target age, T, contained in this question was chosen conditional on the respondent's age, and the distance between current age and target age varied from 10 to 24 years.[12] Guiso et al. (2005) provide evidence based on SHARE that up to age 60, respondents' subjective survival probabilities and their life-table counterparts correspond very well for males but that females tend to underestimate their survival rates. For older people, especially males, there is some evidence of overstatement relative to the life tables.

One well-known problem with self-reported probabilities is the propensity of respondents to report round figures such as 0, 50, 100 (see Hurd and McGarry (1995) and Gan et al. (2005)). As emphasized in Finkelstein and McGarry (2006), if individuals use probabilistic information in their decision to buy insurance, but are unable to translate their latent probability into numbers, the estimates are likely to be underestimates of the extent of individual information. Figure 3 plots the self-assessed probability of being alive at age 75 for individuals aged 50-65 in the 2004 wave. Among women, Danish and Swedish are the ones with the highest subjective survival probability, while Greek and Belgian display the lowest values. Danish and Italian men are the ones who expect to live longer, Greek and Belgian men shorter

Finkelstein and McGarry (2006) and Cutler et al. (2008) stress the role of risk aversion as the explanation for rejection of the "positive correlation" test exploiting proxies for risk aversion based on the completion of standardard preventive tests, i.e. whether the individual had a flu shot, had a mammogram, had a prostate screen, etc. Fang et al. (2008) using direct measures of risk aversion elicited in the Health and Retirement Survey (HRS) do not find that risk preferences have a significant role in explaining advantageous selection in the Medigap insurance market. Since the 2004 SHARE survey does not contain any question about risk attitude, we can not directly

[12] E.g. for individuals in the age group 51-55 the target age is 75; for individuals in the age group 71-75 the target age is 85.

test whether risk preference represents a potential source of private information. However, the 2006 wave of SHARE elicited information on risk aversion. Individuals were asked to choose, from four statements, which was closest to the level of financial risk they would be willing to undertake over when making an investment.[13] Although the self-reported willingness to take financial risks might be a noisy proxy for individual risk preferences, the evidence presented in Figure 4 does not support the hypothesis that individuals in countries with higher insurance coverage are systematically more risk averse.

Table 2 reports how average years of education and cognitive abilities vary across countries. Germans and Austrians, on average, are the best educated (respectively with 13.8 and 13.3 years of education). In order to construct the memory indicator, respondents were shown a list of ten words and then asked to recall them. The indicator is constructed by counting the number of words recalled, and ranges from 0, in the case that a respondent was not able to remember even one word, to 10. In the rest of the paper, we use the terminology from the cognitive psychology literature and refer to this indicator as memory recall, or simply recall. Recall scores are highest for Denmark and Germany (respectively 5.8 and 5.6). Executive function is measured by asking the respondent to name as many animals as possible in exactly one minute. Each respondent is given a score, which is equal to the number of animals that she or he is able to name. We refer to this indicator as verbal fluency, or simply fluency. The fluency score, defined over the range 0-100, peaks for Sweden and Austria (respectively 24.4 and 22.7), with the lowest values for Italy, Spain and Greece (all below 16). Recall and fluency are commonly regarded as proxying for the ability to acquire information.

The indicator for numeracy measures the ability to perform basic numerical operations. SHARE respondents were asked to perform the following simple calculations: (1) find 10 percent of a number; (2) find one half of a number; (3) find the number for which another known number represents two thirds; (4) find 10 percent of another number. Each of the questions refers to a specific economic or financial situation. On the basis of these four questions we constructed a numeracy indicator, which ranges

[13] The statements are: 1) Take substantial financial risks expecting to earn substantial returns; 2) Take above average financial risks expecting to earn above average returns; 3) Take average financial risks expecting to earn average returns; 4) Not willing to take any financial risks.

from 1 to 5.[14] The numeracy indicator varies between 1 and 5 and the highest values are for Sweden and Germany (both around 3.8).

3.2 Empirical Method

In order to test for the presence of asymmetric information in the hospital insurance market in eight European countries, we take two steps. First, we perform the "positive correlation" test introduced by Chiappori and Salanie (2001). For this purpose we estimate the following bivariate probit:

$$Prob(Hosp = 1) = \Phi(\mathbf{X}'\beta_1) \quad (1)$$

$$Prob(HIns = 1) = \Phi(\mathbf{X}'\beta_2) \quad (2)$$

where $Hosp$ is a binary variable that takes the value 1 if the individual has spent at least one night in hospital in the 12 months preceding the 2006 interview. $HIns$ is binary variable that takes the value 1 if the individual had hospital insurance cover in 2004. $\mathbf{X}$ is a vector of the covariates to control for the risk classification that would be assigned to an individual by an insurance company in 2004. All the regressions control for country fixed effects.

Following Chiappori and Salanie (2001), the key parameter is the correlation between the error terms in equations (1) and (2). A unidimensional model of asymmetric information where individuals only have private information about their risk type predicts that the residuals of the two equations are positively correlated ($\rho>0$).[15] The failure to reject the null hypothesis, $\rho = 0$, is consistent both with lack of asymmetric information and the presence of multiple sources of private information, that can eventually offset the positive correlation between insurance cover and ex post loss.

Therefore, in order to discriminate between these two alternative explanations, we test whether individuals have *residual* private information on insurance determinants other than their risk type. For this purpose, we follow the strategy adopted by Finkelstein and McGarry (2006) and we augment the model in equations (1) and (2)

[14] The same indicator is used by Christelis et al. (2005).

[15] A second approach proposed by Finkelstein and Poterba (2004) consists of estimating a probit for accident risk as a function of private insurance cover, controlling for risk classification. The results of this alternative approach are not presented here, but are consistent with those that are.

by including individual self-reported survival probability as elicited from the 2004 wave of SHARE. Finkelstein and McGarry (2006) use the self-reported probability of nursing home use 5 years in the future to test for the presence of asymmetric information in the LTC market in the US. Hurd and McGarry (2002), using panel data from HRS, provide evidence that survival probability changes in response to health shocks and it is a very good predictor of actual mortality. Since insurance companies do not have information about individual survival probability, we interpret this variable as a proxy for individual information about health status and, thus, the chance of needing hospital treatment. If the survival probability is significantly correlated both with the probability of being covered by a hospital insurance and the ex post probability of entering hospital, there are two possible scenarios. On the one hand, if ρ is positive and statistically significant it might be concluded that individuals have private information on their own risk type. On the other hand, failure to reject the null hypothesis, $\rho = 0$, automatically points to the existence of other sources of unobserved heterogeneity which offset the positive correlation between insurance cover and risk occurrence.

The validity of our private information test relies on the ability to condition on the risk classification of the individual by insurance companies. In all the countries covered by our analysis there are strict regulations on the individual characteristics that insurance companies can elicit. Using information in Mossialos and Thomson (2004) and from insurance applications to numerous insurance companies, we can determine which are the individual characteristics that insurance companies observe when setting the price of a hospital insurance policy. As mentioned in the previous section, all companies collect a set of demographic characteristics - age, sex, marital status, age of the partner, employment status, area of residence - as well as detailed information on current and past health. The same information is gathered by SHARE, whose data on current health and medical history are extremely rich and detailed. Therefore, we can replicate insurers' information. Finkelstein and McGarry (2006) proposes two alternative methods to control for insurers' risk classification. The first consists of the actuarial prediction of individuals' risk types, because this is the measure used to generate the insurance premium.

In this paper we use the alternative "application information" approach since we do not have information on the actuarial model used by insurers. In this specification we

attempt to control for all the aspects that insurance companies might observe about an individual as recorded in the 2004 wave. We include a full set of single year age dummies, all the demographic information that insurance companies collect in their applications (sex, marital status, age of spouse, household size, employment status, residence in a metropolitan area) and indicator variables for each of the detailed current and past health characteristics. These indicator variables include: dummies for whether the individual has one (two or more) limitation in activities of daily living (ADL), dummies for whether the individual has one (two or more) limitation in instrumental activities of daily living (IADL); low body mass index; high body mass index; a smoker or not; incidence of depression in the previous four weeks; subject to diabetes, hypertension, cholesterol, arthritis, asthma; history of stroke, cancer, heart attack, lung disease; medication for a heart condition, high blood pressure, diabetes; consultation in the previous 12 months with a GP, a specialist. To be conservative, we also control for household income and wealth terciles, although from our research it emerged that few insurance companies would ask individuals to classify themselves as high, medium or low income. Health insurance might be partly or completely subsidized by employers as part of the benefits scheme. Therefore, conditional on the same risk classification, the amount paid by the individual might vary considerably. In order to control for this possibility, we include a dummy variable that takes value 1 if the health insurance is entirely paid by the policy holder, 0 otherwise.

4 Results

4.1 Baseline results

Table 3 shows the results of the standard positive correlation test, for the hospital insurance market, for eight European countries. Column 1 presents the correlation of the residuals estimated from the bivariate probit in equations (1) and (2) for the basic specification (S1), that controls for the variables as described in the previous section. The correlation coefficient is positive, very small and not significantly different from zero.

In spite of the increasing effort to harmonize pricing rules across countries, there might still be differences in the way how prices are set and the role of the classification

variables might be different in different countries. Ideally, we would like to allow for all the classification variables to simultaneously interact with the country dummies. However, this would make the Maximum Likelihood estimation of the bivariate probit particularly problematic due to the high number of parameters. For this reason we estimate different specifications where different subsets of the control variables are allowed to interact with the country dummies. The importance of sex and employment status as classification variables change with the type of cover (individual or group). Group policies are more common in certain EU countries than others. In Belgium higher charges for commercial insurances are applied to people living in the Brussels area. The same happens in Italy with individuals living in metropolitan areas. In the second specification (S2), we allow the gender dummy, the dummies for the employment status (civil servant, self-employed and retired), and the dummy for living in a metropolitan area to interact with the country dummies. The results are shown in column 2 of Table 3. Also in this case the correlation coefficient ρ is positive, very small and not significantly different from zero.

As we already mentioned above, in some countries people above a certain age are not allowed to buy private insurance. Age is a key determinant of the insurance premium and its role might vary according to the country. In order to account for age effects that vary across countries, in the third specification (S3) we allow the single age dummies to interact with the country dummies. In this case the correlation coefficient is negative, but very small and not significantly different from zero. In certain countries insurers are prohibited by law from carrying out medical examinations. This might determine differences on how past health shocks contribute to determine the insurance premium. In column 4 we present the results for the model where we allow the dummies that control for the number of limitations in activities of daily living and in instrumental activities of daily living, for smoking or not, for being obese or not to interact with country dummies (S4). The correlation coefficient is positive, very small but not significantly different from zero.

In summary, after conditioning for a large set of variables used by the insurance companies to set the price, we can not reject the the null hypothesis of zero correlation between the unobserved characteristics of the decision to purchase a private hospital insurance and the ex post probability of entering hospital. In the textbook adverse selection models, where individuals have only private information about their risk

type, this result would imply that there is no asymmetric information. On the other hand, if other sources of private information are allowed, failure to reject the null hypothesis does not rule out the existence of asymmetric information.

We augment the model in equations (1) and (2) by including the self-reported survival probability. Columns 1 and 2 in Table 4 report the results for the bivariate probit model for the basic specification. We find that, after controlling for the insurers' risk classification, the survival probability is negatively and significantly correlated with the probability of an overnight stay in hospital in the succeeding 2 years. The survival probability is positively, and significantly correlated with the probability of signing a private hospital insurance.[16] Nevertheless, the correlation coefficient for the residuals of the two equations is not significantly different from zero.

Reassuringly, the results do not change when we allow for interactions of the classification variables with the country dummies: the correlation between the self-assessed survival probability and both the probability of purchasing a private hospital insurance and the probability of requiring hospital treatment are in line with those presented in columns 1 and 2. The correlation coefficient between the residual terms in the two equations is never statically significant, irrespective of the subset of control variables we interact with the country dummies.

In a few countries insurance companies are allowed to collect information on the family history of certain diseases. While this information is not available in SHARE, we repeat the exercises performed above controlling for whether parents are still living and, if not, at what age they died. The results not shown are in line with those presented above.

4.2 Sources of Advantageous Selection

The results in the previous section suggest the existence of individual unobserved characteristics that offset the positive correlation between insurance cover and ex post risk of entering hospital. These factors, that have to be omitted from the pricing formulas of insurance companies, need to be positively correlated with insurance cover and negatively correlated with the ex post probability of a hospital overnight stay. In this section we turn our attention on some of these factors.

[16] In a bivariate probit model the marginal effects depend on the coefficients as well as on the joint conditional density function.

Fang et al. (2008) provide evidence that education and cognitive skills are prominent sources of advantageous selection in the Medigap insurance market in the US. However, so far there is no evidence on whether and through which channels schooling and cognitive skills can determine advantageous selection in the private health insurance market in Europe.

As first step, we start investigating how number of years of schooling and proxies for cognitive skills are correlated both with the probability of purchasing a private hospital insurance and the ex post probability of entering hospital. In all the countries covered by our analysis insurance companies are prevented from using information either on education or performances in cognitive tests of insurees. Results for the probit estimates are displayed in the upper and lower panel of Table 5. For each regressor of interest we estimate two specifications. In the odd columns we present the basic specification that controls for age (in single year dummies), the presence and the age of a partner, gender, the logarithm of household income, dummies for household wealth terciles, employment status, household size, for being obese and smoking. In the second specification, presented in even columns, we add dummies that control non linearly for the number of limitations in activities of daily living and instrumental activities of daily living. The upper panel of Table 5 shows a strong and very significant positive correlation between the number of years of formal schooling and the probability of purchasing private insurance: an extra year of education increases the probability of being covered by a hospital insurance by 0.6 percentage points. Similarly, individuals with better memory and numeracy skills are significantly more likely to have a hospital insurance. The effect of the executive function skills, as measured by the fluency score, on the the probability of being covered by insurance is positive, although very small and not significantly different from zero.

The lower panel of Table 5 displays how years of education and cognitive skills are correlated with the ex post probability of spending at least one night in hospital in the 12 months before the 2006 interview. One extra year of education reduces the probability of entering hospital by 0.4 percentage points. Similarly, individuals with better memory skills are less likely to require hospital treatment. While executive function skills are associated with a lower probability of spending at least one night in hospital, the effect is small and not significantly different from zero. The negative association between numeracy skills and ex post loss probability becomes statistically

not significant when we add controls for the number of limitations in daily activities and in instrumental daily activities.

While private hospital insurance allows individuals to choose among a broader set of providers (especially private) and to purchase amenities in public hospitals, a basic set of hospital services are guaranteed under the statutory healthcare system. Private hospital insurance offers a substitute of the statutory coverage for high wealth individuals. This makes wealth a natural candidate as potential source of advantageous selection as insurance companies are prevented from collecting and using information on household wealth. Finkelstein and McGarry (2006) provide evidence that individuals with higher financial wealth are more likely to buy long-term care insurance and less likely to enter a nursing home. Results in the upper and lower of Table 5 suggest that household wealth can represent an important source of advantageous selection in the private health insurance market in Europe: wealthier individual are significantly more likely to buy a hospital insurance and significantly less likely to require a hospital treatment.

4.3 The Role of Health Information

The previous section presented evidence on some of the potential sources of advantageous selection in the private hospital insurance market in Europe. Our results show that years of formal education, and cognitive skills can potentially offset the positive correlation between insurance cover and ex post risk occurrence. Fang et al. (2008) in their analysis of the ways that cognitive ability can determine advantageous selection in the Medigap insurance market, point to three potential (not necessarily exclusive) mechanisms. First, more cognitively able individuals might be better able to evaluate the benefits and the costs of purchasing Medigap. Second, individuals with better cognitive skills have lower search costs. Finally, cognitive skills might be associated with better awareness of health risks. Disentangling these explanations is challenging but has some crucial policy implications. Fang et al. (2008) provide some (not conclusive) evidence that the second mechanism, search costs, is not important but they do not test for the other mechanisms.

In this section we test whether the ability to acquire health related information can explain, at least in part, the importance of education and cognitive skills as sources

of advantageous selection. Consider two individuals who have the same initial health status but different levels of education (cognitive ability). The high education (cognitive ability) individual is more aware of future health risks and the potential need for hospital treatments than the low education one. The first one is more likely to buy health insurance than the latter. At the same time, the better informed individual is less likely to engage in risky behaviours (e.g. drinking, smoking) and more likely to undergo preventive screening.[17] Different types of health related information might be relevant. Individuals might be more informed about health risk factors and the benefits of early screening. All else being equal, they might simply be better informed about the functioning of the healthcare system and its quality standards: for instance, individuals aware of the poor quality of public hospitals might take out private insurance in order to secure faster and cheaper access to a private hospital. In our analysis we cannot distinguish among different health information content.

Preliminarly, we use data from Eurobarometer "European citizens and sources of information about health" (2002) to provide evidence on whether better educated individuals are more or less likely to rely on health information sources other than health professionals. This source asks respondents about their main sources of information on health from the following options: health professionals (doctors, pharmacists, nurses), newspapers, magazines, books, specialist press, television, radio, the Internet, short courses, family and friends. Individuals are also asked whether they have ever used any or all of these information sources. 45% of individuals aged 20-80 in the eight European countries covered by our analysis use health professionals as their main source of health information. 18% of the sample rely mainly on information received through television, 8% rely on newspapers and around 4% on the Internet (see Figure 5).[18]

We use two outcome variables to study how the level of education affects the way that individuals obtain health information. First, we create a dummy variable that takes the value 0 if the individual uses health professionals as the main source of health information, 1 if the main source is any of the alternatives mentioned above,

[17]Kenkel (1991) finds that more informed individuals tend to follow healthier life styles. Kenkel (1990) provides evidence that poorly informed consumers tend to underestimate the productivity of medical care in treating illness.

[18]Bundorf et al. (2004) report that in 2001 38% of Americans looked for or obtained information about their health from a source other than their doctors.

which we classify as informal sources. Second, we create a continuous variable for the number of health information sources other than health professionals used by the individual. The results in the first column of Table 6 suggest that individuals who have completed tertiary schooling or higher are more likely to use an informal rather than a health professional as the main source of health information.[19] The number of informal health information sources used increases with the level of education (see column 2 in Table 6).[20] These results support the hypothesis that more educated individuals are more likely to rely on informal sources of health information.[21]

In order to test formally whether more educated (cognitively able) individuals are more likely to demand more insurance because they have better health information, we exploit variations in the average quality of health promotion across EU regions and study whether the effects of education and cognitive skills on the probability of purchasing hospital insurance increases as the quality of information provided by regional health professionals declines. The ratio of the test is the following: given the same healthcare organization, the incentive to acquire health information through informal channels should be higher in those regions where the quality of information provided by health professionals is poorer. However, the evidence discussed above supports the hypothesis that the cost of acquiring health information from sources other than health professionals is lower for the better educated. Therefore, if the ability to acquire information is one of the mechanisms driving the correlation between education (cognitive ability) and insurance purchase, we expect the better educated to be less affected by the quality of the information provided by health professionals.

A feature common to the countries considered in this study is that regional governments are largely autonomous in their allocation of healthcare resources. Therefore, within the same country, the quality of health promotion can vary substantially across regions. Using information on respondent's region of residence (105 regions in total), we construct different measures for the quality of health promotion at regional level. Our preferred indicator is the proportion of individuals aged 65 or over who have

[19]The results do not change if we exclude individuals who use specialist press or short courses as the source of information.

[20]If we restrict the sample to individuals aged 50-75 the results are in line with those discussed, but the number of observations is much smaller.

[21]Previous works (e.g. Lleras-Muney and Lichtenberg (2002) and Glied and Lleras-Muney (2008)) provide evidence that better educated individuals are more likely to be early adopters of new medical technologies.

been advised by a doctor to have a flu vaccination in the 12 months before the 2004 survey. The average proportion is 0.62 with a standard deviation of 0.21. In almost all Belgian regions 80% or more of the individuals aged 65 plus were advised to have a flu vaccination; at the opposite end, for many regions of Greece, the percentage is around 20%. While in Belgium and Austria there are very small differences across regions, in Italy and Greece there are dramatic regional differences. Vaccination against flu has been proved to be a cost effective way to reduce the incidence of respiratory diseases and, in most EU countries, is offered free of charge to people aged over 65. Unlike other preventive treatments, it can be administered by doctors, pharmacists and nurses. The reason for our focus on the percentage advised to have the vaccination rather than on the effective take up is that the former is a better proxy for the quality of supply of health promotion, while the latter could be considered as an equilibrium outcome that potentially could be affected by other factors.

Denoting V as the mean centered proportion of individuals aged 65 or over who have been advised to have the flu vaccination in the region of residence, we estimate the following equation using a probit model:

$$HIns_{ij} = \alpha + \beta_1 E_i + \beta_2 V_j + \beta_3 E_i * V_j + \gamma' X_{ij} + u_{ij} \tag{3}$$

where $HIns_{ij}$ takes the value 1 if an individual i in region j was covered by a hospital insurance in year 2004, 0 otherwise. E_i controls for education (cognitive ability) of individual i, V_j for the quality of health promotion in region j.[22] For each proxy for the individual ability to acquire information we estimate two specifications. In the first specification X_{ij} controls, among other things, for individual demographic characteristics, logarithm of household income, household wealth terciles, dummies for whether the individual smokes or not, and is obese or not, socio-demographic characteristics of region of residence - proportion of women, proportion of individuals aged 65 or over, regional wealth and average number of years of education. In order to account for differences in health supply characteristics other than the quality of health promotion we include dummies for the average waiting time for an outpatient treatment in the region. In the second specification we add dummies for the number

[22]Because of the non linearity of the probit model, by taking the mean centered proportion of individuals advised, we can interpret the marginal effect of E_i as the average marginal effect of education (Imbens and Wooldridge (2007)).

of limitations in daily activities and instrumental daily activities. All the regressions include country fixed effects.

The coefficients of interest are β_1 and β_3.[23] A finding of $\beta_1 > 0$ and $\beta_3 < 0$ is consistent with the health information hypothesis. A smaller effect of education in regions with better health promotion is a marker for the importance of information as one of the relevant mechanisms to explain the correlation between education and propensity to buy insurance.

Results in Table 7 show that years of education and cognitive skills are all positively correlated with the probability of signing a private hospital insurance. On average, an extra year of education increases the probability of signing a private hospital insurance by 0.5 percentage points. However, the effect declines significantly as the regional quality of health promotion improves. Results are similar when we study the effect of memory skills. A one standard deviation increase in the score for the recall test is associated with an increase of 1.6 percentage points in the probability of signing a private hospital insurance but the effect declines significantly as the regional proportion of individuals who have been advised to have flu vaccinations increases (see columns 3 and 4 of Table 7). The marginal effects on the interactions are hard to interpret. In order to provide a measure of the magnitude of the substitutability between recall and regional quality of health promotion, we investigate the differential effect of a one standard deviation increase in the recall scores for a person living in a region with low quality healthcare promotion compared to a person living in a high quality health promotion region. We classify as low (high) quality health promotion those regions where the average proportion of individuals aged 65 plus that are advised to have a flu vaccination is one standard deviation below (above) the mean. The effect of a one standard deviation increase in the recall test is 1.2 percentage points higher in regions with low quality healthcare promotion compared to regions with high quality promotion.

On average, a better score on the fluency test has a positive but not significant impact on the probability of signing a hospital insurance. In line with the results presented above, the effect significantly declines as the regional proportion of 65 plus advised to have a flu vaccination increases (see columns 5 and 6 of Table 7).

In section 3.1 we refer to the SHARE survey collecting information on the ability

[23] For notational simplicity, we use the coefficient when referring to the marginal effect.

to perform mathematical operations, i.e., the numeracy indicator. According to the cognitive psychology literature this is a proxy for the ability to process as opposed to the ability to acquire information (see Reyna and Brainerd (2008)).[24]. In line with an explanation based on the ability to acquire information, we do not expect any significant substitutability between the ability to perform mathematical operations and the proxy for the quality of the information received by health professionals. We find that, while the average effect of numeracy is strong and significant, the marginal effect on the interaction term is not significantly different from zero.

One obvious concern is that education might have an effect on the propensity to buy private insurance that varies with other regional characteristics not included in our regressions. In order to control for this potential bias, we estimate the model in equation (3) including region fixed effects. The marginal effects on the interaction terms are almost identical to the ones reported in Table 7. However, since for some regions we have very few observations, the standard errors are higher.

In order to boost confidence in our results, we test equation (3) using an alternative measure for regional healthcare promotion. According to medical guidelines colonoscopy should be recommended to individuals aged 50 or over, independent of the individual's health history. The test is usually advised by a specialist or a GP, and in only a few countries is free of charge for the over 50s. As an alternative measure of the quality of healthcare promotion we use the regional proportions of individuals aged 50-85 advised by a health provider to have a colonoscopy at least once in the last 10 years. The results in Table 8 support those presented in Table 7.

The findings in this section, while not conclusive, suggest that the decision to buy a hospital health insurance is characterized by a significant substitutability between individual ability to acquire information and the average quality of the information provided by health professionals. We interpret these results as evidence supporting the hypothesis that the cost of acquiring health related information is one of the mechanisms that explain the role of education and cognitive skills as sources of advantageous selection in the hospital insurance market in Europe. In order to rule out some of the competing explanations for our results, in the next section we perform a

[24]The literature shows that numerical ability is positively correlated with the propensity to buy more complex retirement plans and to invest in the stock market (see, among others, Christelis et al. (2005) and Lusardi and Mitchell (2006))

variety of robustness tests.

4.4 Robustness Tests

So far, we have argued that the fact that the effect of education and cognitive abilities on the probability of taking out a hospital insurance declines as the quality of health promotion increases, is evidence that the cost of acquiring health information matters in the decision to buy a private health insurance. Identification of the information channel effect might be confounded by the possible presence of factors that are correlated with the variables of interest. Decomposing the error term in equation (3) into two components $u_{ij} = \epsilon_{ij} + \mu_j$ makes it clear that there might be omitted factors that vary at both the individual-regional and regional levels. More education and better cognitive ability might be associated with lower discount rates and higher risk aversion,[25] inducing individuals to buy more private insurance and to move to regions where the quality of the healthcare is higher. In that case we would expect the interaction between education (cognitive skills) and proportion of individuals in a region who have been advised to have a flu vaccination to be positive. If anything, our results should represent a downward biased estimate of the degree of substitutability.

Even in the absence of endogenous sorting, if the measures of the ability to acquire information are positively correlated with risk aversion, our results potentially might be explained by the fact that more risk averse individuals are more likely to buy private insurance as a response to the poor quality of the public healthcare. In order to rule out this hypothesis, we test whether the effect of education and cognitive abilities increases with the average waiting time in the region. The marginal effect of the interaction terms, while always positive, is statistically significant only when we take the interaction of the fluency score with the dummy for the highest tercile (see Table 9).

So far, we have assumed that the only relevant type of information is health related, but this might not necessarily be the case. Private health insurance might be part of a broader package that includes other types of insurances, e.g. life insurance,

[25] Cutler and Lleras-Muney (2008) argue that on average people with more schooling learn to dislike risk more. However, the empirical relationship between education and risk aversion appears to be u-shaped: very high and very low education levels are associated with more risk taking, whereas individuals with moderate amounts of schooling are the most risk averse.

home insurance. Therefore, individuals might be more likely to buy private hospital insurances in those regions where the quality of the financial information is better. In order to test this hypothesis, we study whether the effect of education and cognitive skills is lower in those regions where there is a higher fraction of individuals aged 50 or over who are stockholders. While the regional proportion of stockholders is positively associated with the propensity to buy a private hospital insurance, its correlation with hospital insurance purchase does not vary significantly with education and cognitive ability (see Table 10).

5 Conclusions

This paper presents evidence from the first two waves of SHARE, of the existence of asymmetric information in the market for private hospital insurance among the elderly in eight European countries.

So far there is no evidence on whether asymmetric information may contribute to explaining the low number of individuals aged 50 plus covered by private health insurance across European countries. Unidimensional models of private information predict a positive correlation between insurance cover and ex post loss. Consistent with the evidence for other insurance markets, we fail to detect any significant positive correlation between hospital insurance cover and the ex post risk of requiring hospital treatment. Our results suggest the presence of multidimensional sources of private information that lead to advantageous selection. Among all the potential sources of advantageous selection, we investigate the role of education and cognitive abilities and we find that individuals with better education and better cognitive skills are both more likely to subscribe hospital insurance and less likely to need hospital treatments in the future.

As possible explanation for this result, we looked at the ability to acquire health information. We show first that better educated individuals are more likely to substitute the information received by health professionals with that acquired through alternative sources, i.e. newspapers, television, the Internet. We then tested whether better educated individuals are less likely to be affected by the regional quality of health promotion in deciding whether to buy a private hospital insurance. Our results provide suggestive evidence of significant substitutability between the individual

ability to acquire information and the quality of information provided by health professionals.

Our findings can be read as evidence that investments in health promotion can increase the awareness of health risks, especially among the elderly, producing positive indirect effects on the propensity to buy private insurance. Therefore, when evaluating the benefits and costs of health promotion programmes government should take explicit account of these indirect effects.

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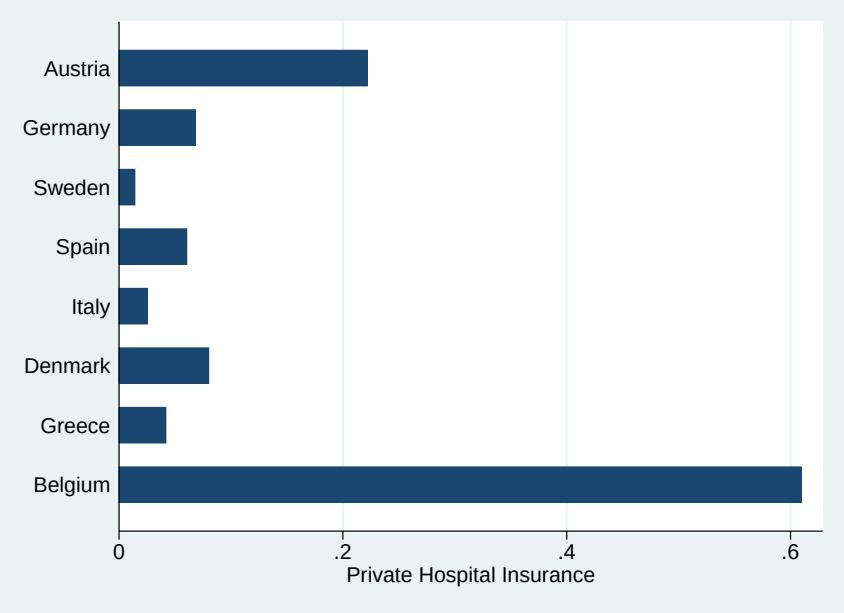
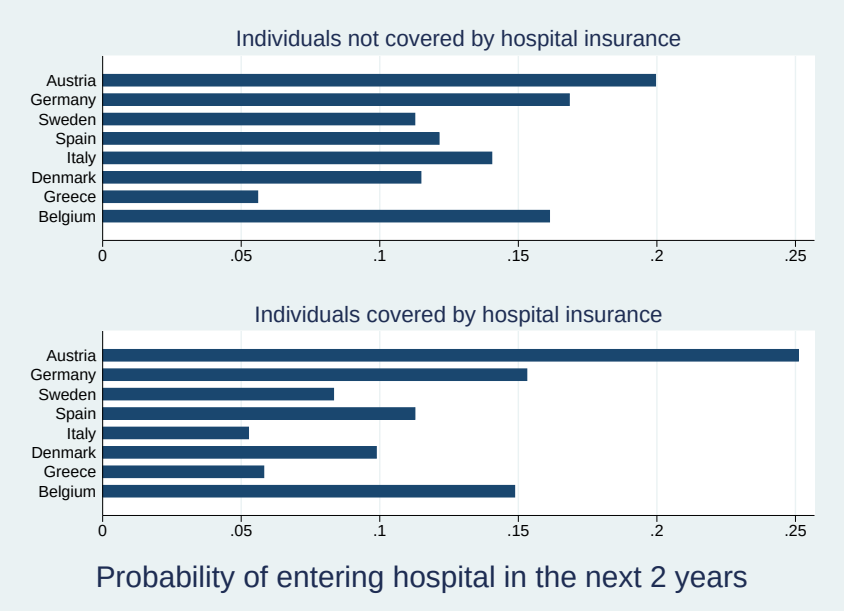
Figure 1: International Comparison: Hospital Insurance Coverage



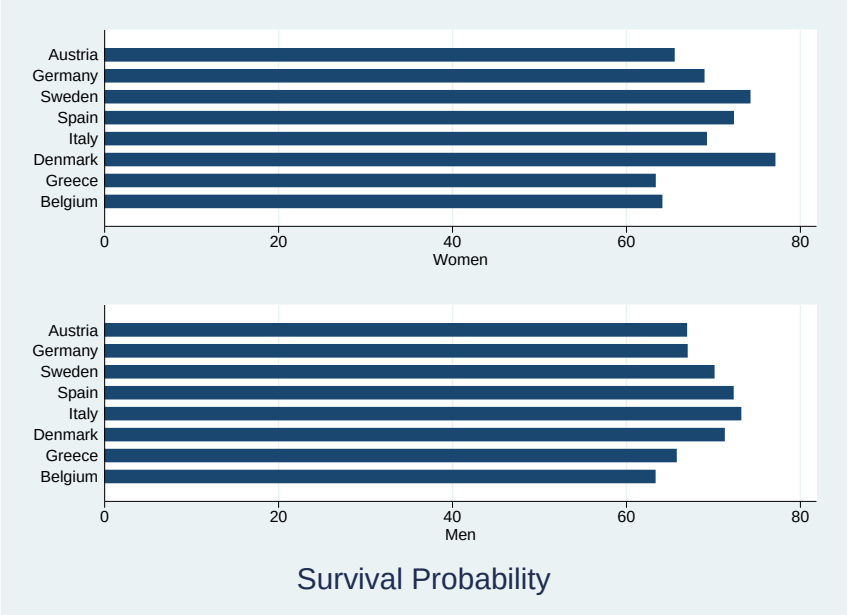
Note: The sample includes individuals aged 50-75 in the 2004 wave.

Figure 2: Accident Risk by Hospital Insurance Status



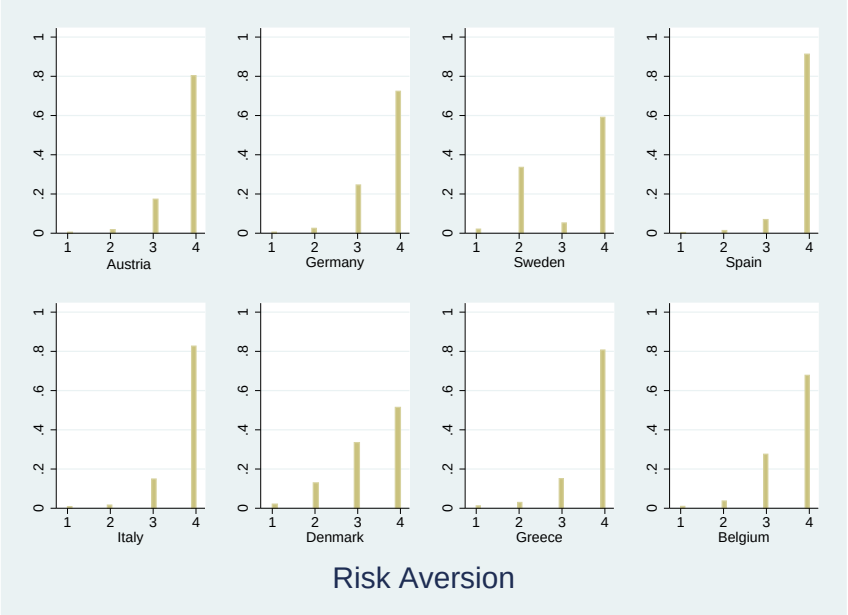
Note: Accident risk is defined as the average probability of having an overnight stay in hospital in the 12 months preceding the 2006 interviews, for individuals aged 50-75 in the 2004 wave. Insurance status is defined according to 2004 responses.

Figure 3: Self-Assessed Survival Probability at the Age 75



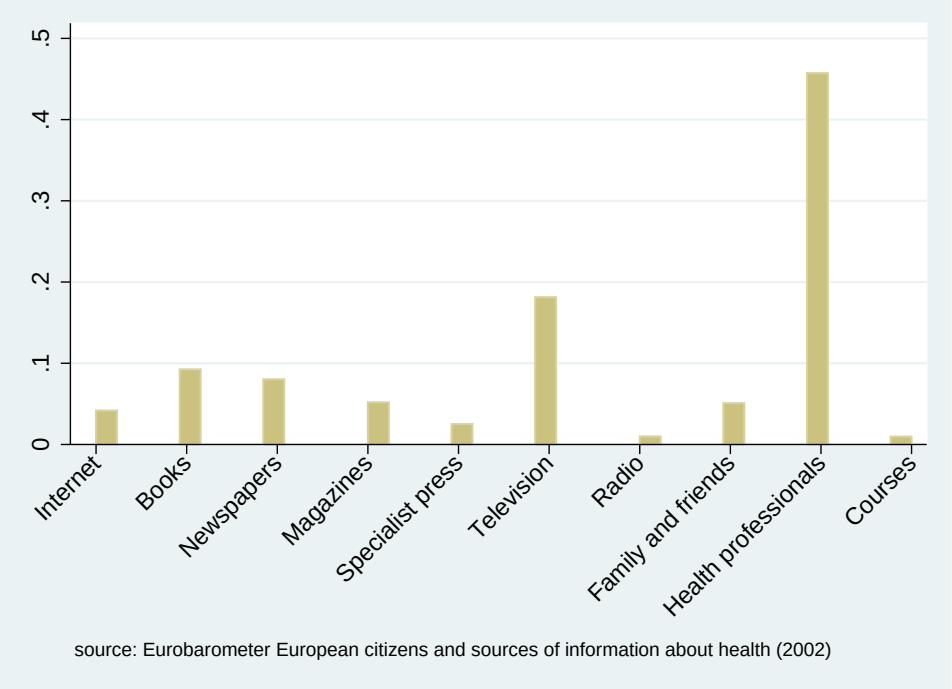
Note: The sample includes men and women aged 50-65 in the 2004 wave. The target age in the survival probability question is 75.

Figure 4: International Comparison in Attitudes towards Risk



Note: The sample includes all individuals aged 50-75 in 2004 who have been re-interviewed in the 2006 wave. Information on risk averseness is elicited in the 2006 wave and is measured by the propensity to take substantial financial risks with the expectation of earning substantial returns. 1 denotes the lowest level of risk aversion, 4 the highest (see text for explanations).

Figure 5: Main Source of Information about Health among European Citizens



Note: The sample includes men and women aged 20-80 in the eight EU countries covered by our analysis.

Table 1: VPHI rating criteria

Country	**Variables used for rating premiums**	**Medical Information Procedures required for application**
Austria	Age at entry, sex, marital status, individual health status	Insurers are prohibited by law from carrying out examinations
Belgium	Mutual: group rates according to the level of coverage. Commercial: age, sex, area of residence, level of coverage, level of deductible	Mutual: only some mutuals require a medical questionnaire. Commercial: medical questionnaire and/or examination
Denmark	Mutual: group rates according to the level of coverage. Commercial: age, employment status	Medical questionnaire
Germany	Age at entry, sex, health status	Medical questionnaire
Greece	Age, sex, profession, family and individual health status	Medical questionnaire, examination, x-rays
Italy	Age, sex, health status, area of residence	Medical questionnaire
Spain	Age, sex	Medical questionnaire
Sweden	Age, health status	Medical questionnaire, examination (in rare cases)

Source: Mossialos and Thomson (2004)

Table 2: Descriptives

	Austria	**Germany**	**Sweden**	**Spain**	**Italy**	**Denmark**	**Greece**	**Belgium**
Years of Education	11.415	13.857	10.826	5.945	7.312	13.316	9.442	10.861
	(2.548)	(2.579)	(3.131)	(4.256)	(4.154)	(3.100)	(4.605)	(3.643)
Memory	5.395	5.649	5.631	3.834	4.325	5.755	5.105	5.203
	(1.751)	(1.579)	(1.536)	(1.669)	(1.552)	(1.559)	(1.505)	(1.591)
Verbal Fluency	22.895	21.404	24.491	15.524	14.715	22.667	15.158	20.628
	(9.228)	(6.846)	(6.883)	(5.353)	(5.548)	(6.657)	(4.759)	(6.152)
Numeracy	3.739	3.766	3.767	2.563	2.952	3.637	3.526	3.444
	(0.934)	(0.996)	(0.965)	(1.025)	(0.994)	(1.058)	(1.047)	(0.991)

Note: Descriptives are based on the 2004 answers of individuals aged 50-75. Standard deviations are reported in parenthesis.

Table 3: Positive Correlation Test

	S1 **(1)**	S2 **(2)**	S3 **(3)**	S4 **(4)**
Correlation Coefficient Bivariate Probit	0.003	0.004	-0.020	0.014
Likelihood Ratio Test	0.005	0.007	0.143	0.074
Insurers Controls	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes
Set I*Country Dummies	No	Yes	No	No
Set II*Country Dummies	No	No	Yes	No
Set III*Country Dummies	No	No	No	Yes
Observations	4647	4647	4647	4647

Note: The dependent variables of the bivariate probit are the dummy for whether the individual has private hospital insurance cover in 2004 and the dummy that takes value 1 if the individual has been in hospital over night in the 12 months preceding the 2006 interview. Individual characteristics were measured in 2004 survey. *Insurers Controls* include controls for age (in single year dummies), sex, marital status, age of spouse, employment status, residence in a metropolitan area, household income terciles, household wealth terciles, for whether the premia have been entirely paid by the policy holder, for current and past health status (see text for the complete list).
Set I includes dummies for sex, employment status, and residence in a metropolitan area. *Set II* includes the full set of single year age dummies. *Set III* includes dummies that control for the number of limitations in activities of daily living and in instrumental activities of daily living, for smoking and for being obese.

Table 4: Test for residual private information

	S1		S2		S3		S4	
	Hospital Overnight	Hospital Insurance	Hospital Overnight	Hospital Insurance	Hospital Overnight	Hospital Insurance	Hospital Overnight	Hospital Insurance
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Survival Probability	-0.265***	0.277**	-0.269***	0.283**	-0.270***	0.264*	-0.295***	0.263**
	(0.096)	(0.129)	(0.097)	(0.126)	(0.103)	(0.139)	(0.098)	(0.131)
	[-0.052]	[0.035]	[-0.053]	[0.035]	[-0.050]	[0.031]	[-0.057]	[0.032]
Correlation Coefficient Bivariate Probit	0.009		0.012		-0.014		0.023	
Likelihood Ratio Test	0.034		0.060		0.061		0.185	
Insurers Controls	Yes		Yes		Yes		Yes	
Country Dummies	Yes		Yes		Yes		Yes	
Set I*Country Dummies	No		Yes		No		No	
Set II*Country Dummies	No		No		Yes		No	
Set III*Country Dummies	No		No		No		Yes	
Observations	4472		4472		4472		4472	

Note: *** denotes significance at 1%, ** at 5% and * at 10%. Standard errors of bivariate probit coefficients are reported in parenthesis. Marginal effects are reported in brackets. The dependent variables for the bivariate probit are the dummy for whether the individual owned a private hospital insurance in 2004 and the dummy that takes the value 1 if the individual has been in hospital over night in the 12 months preceding the 2006 interview. Survival probability has been rescaled to between 0 and 1. *Insurers Controls*, *Set I*, *Set II* and *Set III* are defined as in Table 3.

Table 5: Sources of Advantageous Selection

	Hospital insurance							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Years of Education	0.006***	0.006***						
	(0.001)	(0.001)						
Memory			0.009***	0.009***				
			(0.003)	(0.003)				
Verbal fluency					0.001	0.001		
					(0.001)	(0.001)		
Numeracy							0.015***	0.015***
							(0.004)	(0.004)
II Wealth Tercile	0.032***	0.032***	0.033***	0.033***	0.035***	0.035***	0.032***	0.032***
	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)
III Wealth Tercile	0.062***	0.062***	0.067***	0.067***	0.070***	0.070***	0.065***	0.065***
	(0.013)	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Hospital Overnight							
Years of Education	-0.004***	-0.004***						
	(0.001)	(0.001)						
Memory			-0.007**	-0.005*				
			(0.003)	(0.003)				
Verbal fluency					-0.001	-0.000		
					(0.001)	(0.001)		
Numeracy							-0.010**	-0.007
							(0.005)	(0.005)
II Wealth Tercile	-0.029***	-0.026**	-0.028***	-0.025**	-0.030***	-0.028***	-0.029***	-0.026**
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
III Wealth Tercile	-0.025**	-0.021*	-0.027**	-0.023**	-0.030**	-0.025**	-0.029**	-0.024**
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health Controls	No	Yes	No	Yes	No	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5858	5858	5857	5857	5843	5843	5877	5877

Note: *** denotes significance at 1%, ** at 5% and * at 10%. Marginal effects from heteroskedasticity robust univariate probit are reported. The dummy variable Hospital Insurance takes the value 1 if the individual owned a private hospital insurance in 2004. The dummy variable Hospital Overnight takes the value 1 if the individual has been in hospital over night in the 12 months before the 2006 interview. *Baseline Controls* include single year age dummies, sex, marital status, employment status dummies, household size, household income (in logs), wealth terciles, dummies for whether the individual is obese and smokes as recorded in 2004. *Health Controls* include dummies for having one (two or more) limitation to activities of daily living, dummies for having one (two or more) limitation in instrumental activities of daily living.

Table 6: Education and Health Information Sources

	Informal as main source (Y/N)	Number of informal sources
	(1)	**(2)**
Age 30-40	-0.003	0.005
	(0.018)	(0.050)
Age 40-50	-0.020	0.057
	(0.018)	(0.051)
Age 50-60	-0.026	0.068
	(0.019)	(0.054)
Age 60+	-0.067***	-0.029
	(0.017)	(0.049)
Secondary Education	0.024	0.201***
	(0.018)	(0.049)
Tertiary Education	0.092***	0.501***
	(0.020)	(0.056)
Country Dummies	Yes	Yes
Observations	7225	7393

Note: *** denotes significance at 1%, ** at 5% and * at 10%. Marginal effects from heteroskedasticity robust univariate probit are reported in the first column. OLS coefficients are reported in the second column. The dependent variable in the first column is the dummy variable that takes value 0 if the individual uses a health professional as main source, 1 if the main source is one of the following: newspapers, magazines, books, specialist press, television, radio, the Internet, course, family and friends. The dependent variable in the second column is the total number of health sources other than health professionals used by the individual and it can vary between 0 and 8. Results are based on the Eurobarometer "European citizens and sources of information about health" (2002). Additional controls include dummies for sex, marital status, employment status. The sample includes individuals aged 20-80 in the eight countries covered in the analysis.

Table 7: Hospital Insurance Take Up and Quality of Health Promotion

	Hospital insurance							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Years of Education	0.005***	0.005***						
	(0.001)	(0.001)						
Memory			0.008***	0.009***				
			(0.003)	(0.003)				
Verbal fluency					0.001	0.001		
					(0.001)	(0.001)		
Numeracy							0.014***	0.014***
							(0.004)	(0.004)
Prop Advised Flu Vacc.	-0.020	-0.020	-0.027	-0.027	-0.041	-0.041	-0.027	-0.027
	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.040)	(0.040)
Education*Prop Adv. Flu Vacc.	-0.011**	-0.011**						
	(0.006)	(0.006)						
Memory*Prop Adv. Flu Vacc.			-0.032**	-0.032**				
			(0.015)	(0.015)				
Verbal fluency*Prop Adv. Flu Vacc.					-0.007**	-0.007**		
					(0.004)	(0.004)		
Numeracy*Prop Adv. Flu Vacc.							-0.029	-0.029
							(0.022)	(0.022)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health Controls	No	Yes	No	Yes	No	Yes	No	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5870	5870	5869	5869	5855	5855	5889	5889

Note: *** denotes significance at 1%, ** at 5% and * at 10%. Marginal effects from heteroskedasticity robust univariate probit are reported. The marginal effect on the interaction term is calculated using the method suggested by Norton et al. (2004). Standard errors are calculated using 200 bootstrap repetitions. The dummy variable Hospital Insurance takes the value 1 if the individual owned a private hospital insurance in 2004. Prop Advised Flu Vacc. is the proportion of individuals in the region aged 65 or over that were advised by a doctor to have a flu vaccination. *Baseline Controls* include single year age dummies, sex, marital status, occupational dummies, household size, household income (in logs), wealth terciles, dummies for whether the individual is obese and is a smoker as recorded in 2004, and regional characteristics. They also include regional characteristics: the proportion of women, the proportion of people aged 65 or over, average number of years of education, wealth terciles and dummies for outpatient waiting times terciles. *Health Controls* include dummies for having one (two or more) limitation to activities of daily living, dummies for having one (two or more) limitation in instrumental activities of daily living.

Table 8: Hospital Insurance and Alternative Measure of Health Promotion

	Hospital insurance							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Years of Education	0.005***	0.005***						
	(0.001)	(0.001)						
Memory			0.009***	0.009***				
			(0.003)	(0.003)				
Verbal Fluency					0.001	0.001		
					(0.001)	(0.001)		
Numeracy							0.014***	0.014***
							(0.004)	(0.004)
Prop Advised Colonscopy	0.043	0.042	0.037	0.037	0.050	0.050	0.047	0.046
	(0.062)	(0.062)	(0.063)	(0.064)	(0.065)	(0.065)	(0.064)	(0.064)
Education*Prop Adv. Colonscopy	-0.006	-0.006						
	(0.012)	(0.012)						
Memory*Prop Adv. Colonscopy			-0.047*	-0.048*				
			(0.025)	(0.025)				
Fluency*Prop Adv. Colonscopy					-0.012**	-0.012**		
					(0.006)	(0.006)		
Numeracy*Prop Adv. Colonscopy							-0.001	-0.002
							(0.040)	(0.040)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health Controls	No	Yes	No	Yes	No	Yes	No	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5874	5874	5873	5873	5859	5859	5893	5893

Note: *** denotes significance at 1%, ** at 5% and * at 10%. Marginal effects from heteroskedasticity robust univariate probit are reported. The marginal effect on the interaction term is calculated using the method suggested by Norton et al. (2004). Standard errors are calculated using 200 bootstrap repetitions. The dummy variable Hospital Insurance takes the value 1 if the individual owned a private hospital insurance in 2004. Prop Advised Colonoscopy is the proportion of individuals in the region aged 50 or over that were advised by a health provider to have a colonoscopy. *Baseline Controls* and the *Health Controls* are defined as in Table 7

Table 9: Hospital Insurance Take Up and Waiting Time

	Hospital insurance							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Years of Education	0.005***	0.005***						
	(0.001)	(0.001)						
Recall			0.009***	0.009***				
			(0.003)	(0.003)				
Verbal Fluency					0.001	0.001		
					(0.001)	(0.001)		
Numeracy							0.014***	0.014***
							(0.004)	(0.004)
Regio Wait II	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.005	-0.005
	(0.011)	(0.011)	(0.012)	(0.012)	(0.010)	(0.010)	(0.010)	(0.010)
Regio Wait III	-0.004	-0.004	-0.003	-0.003	-0.004	-0.004	-0.006	-0.006
	(0.017)	(0.017)	(0.016)	(0.016)	(0.015)	(0.015)	(0.017)	(0.017)
Education*Regio Wait II	-0.000	-0.000						
	(0.002)	(0.002)						
Education*Regio Wait III	0.004	0.004						
	(0.003)	(0.003)						
Recall*Regio Wait II			0.007	0.007				
			(0.006)	(0.006)				
Recall*Regio Wait III			0.009	0.009				
			(0.007)	(0.007)				
Fluency*Regio Wait II					0.001	0.001		
					(0.001)	(0.001)		
Fluency*Regio Wait III					0.003**	0.003**		
					(0.002)	(0.002)		
Numeracy*Regio Wait II							0.012	0.012
							(0.009)	(0.009)
Numeracy*Regio Wait III							0.004	0.004
							(0.011)	(0.011)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health Controls	No	Yes	No	Yes	No	Yes	No	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5870	5870	5869	5869	5855	5855	5889	5889

Note: *** denotes significance at 1%, ** at 5% and * at 10%. Marginal effects from heteroskedasticity robust univariate probit are reported. The marginal effect on the interaction term has been calculated using the method suggested by Norton et al. (2004). Standard errors are calculated using 200 bootstrap repetitions. The dummy variable Hospital Insurance takes the value 1 if the individual owned a private hospital insurance in 2004. Regio Wait II and Regio Wait III are the dummy variables for the second and third terciles of regional waiting time calculated as a sample average of individual responses on the number of months waited before the last outpatient treatment. *Baseline Controls* and *Health Controls* are defined as in Table 7.

Table 10: Hospital Insurance Take Up and Stock Market Participation

	Hospital insurance							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Years of Education	0.005***	0.005***						
	(0.001)	(0.001)						
Recall			0.009***	0.009***				
			(0.003)	(0.003)				
Verbal Fluency					0.001	0.001		
					(0.001)	(0.001)		
Numeracy							0.014***	0.014***
							(0.004)	(0.004)
Prop Stock Market	0.263	0.268	0.242	0.248	0.239	0.244	0.240	0.244
	(0.167)	(0.167)	(0.160)	(0.160)	(0.170)	(0.169)	(0.158)	(0.157)
Education*Prop Stock Market	-0.009	-0.010						
	(0.014)	(0.014)						
Recall*Prop Stock Market			-0.008	-0.008				
			(0.034)	(0.034)				
Fluency*Prop Stock Market					0.006	0.006		
					(0.008)	(0.008)		
Numeracy*Prop Stock Market							-0.029	-0.029
							(0.042)	(0.042)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health Controls	No	Yes	No	Yes	No	Yes	No	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5878	5878	5877	5877	5863	5863	5897	5897

Note: *** denotes significance at 1%, ** at 5% and * at 10%. Marginal effects from heteroskedasticity robust univariate probit. The marginal effect on the interaction term is calculated using the method suggested by Norton et al. (2004). Standard errors are calculated using 200 bootstrap repetitions. The dummy variable Hospital Insurance takes the value 1 if the individual owned a private hospital insurance in 2004. Prop Stock Market is the proportion of individuals in the region aged 50 or over that invest in the stock market. *Baseline Controls* and *Health Controls* are defined as in Table 7.